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Citrus Nursery Inspection ...In Florida

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While the subject of this paper is citrus nursery inspection in Florida, nursery inspection in general will be discussed.

The Nursery Inspection Department of the State Plant Board was first started in the summer of 1915. At that time a destructive disease of citrus, commonly known as citrus canker, was present in the state and was responsible for great injury and even death of many citrus trees.

Citrus canker was introduced into the United States about 1910, on trifoliata seedlings imported from Japan prior to the passage of the National Plant Quarantine Act of 1912. Several carloads of this imported material had been shipped to certain nurseries in Florida. Citrus trees contaminated with the disease had been shipped from these nurseries throughout the state. By 1912 growers, particularly in Dade county, were panic stricken as the result of the swift spread of the disease and the apparent impossibility of controlling it. It was first thought to be an unusual manifestation of the common citrus scab, and the control measures recommended for scab were used on citrus canker. Instead of being scab, it developed that canker was a highly infectious bacterial disease, which could be spread by men working in groves, by animals, and by birds. As a last resort, the growers turned to burning of affected trees for the purpose of preventing spread of the disease.

In 1915 growers demanded of the Legislature that some state agency with authority to handle situations of this nature be created, and the Florida Plant Act of 1912, creating the State Plant Board, was enacted. The Board immediately started the inspection of all citrus nurseries in the state, and it was soon learned that there were three or four severely infected with citrus canker. Attempts were made to trace to destinations all trees shipped from these nurseries, in order to determine whether or not they were diseased. However, these attempts, made through examinations of the records of nurseries, transportation companies, and the post offices, were not entirely satisfactory. Although it is true that a large number of trees were located from these records, those that could not

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Effect Of Lead Arsenate Spray On The Seasonal Changes In Florida Grapefruit1/...

Introduction

The spraying of grapefruit trees with lead arsenate is a common practice in Florida, dating back to the time when the spray was used as a control for insect infestation. In those earlier times when lead arsenate was used for insect control, growers observed that the fruit from sprayed trees contained less acid and seemed sweeter than that from trees not sprayed with lead arsenate; subsequently, the spray came to be used solely for the purpose of obtaining sweeter fruit. The quantity of arsenic applied for this latter purpose is so small that only barely detectable residues, if any at all, are left on the rind of the fruit at time of harvest. The influence of the arsenate spray in lowering the acidity of the fruit appears to be systemic in the tree and is exerted largely from deposits on the leaves rather than on the fruit. The physiological basis for the effect is still obscure.

The information reported here is on the effect of lead arsenate spray on the maturity, ripening, and palatability of grapefruit (**Citrus paradisi** Macfad.), and has been assembled from data published in a more comprehensive bulletin by Harding and Fisher (2).

Relation of the Arsenical Spray Law to Grapefruit

Injudicious use of lead arsenate on various types of citrus trees in order to effect an earlier attainment of legal maturity of the fruit prompted the Florida State Legislature to pass the Asrenical Spray Law (3. p. 5), which is briefly described as follows:

AN ACT to Prohibit the Use of Arsenic or Any of Its Derivatives or Any Combination, Compound or Preparation Containing Arsenic, as a Fertilizer or Spray on Bearing Citrus Fruit Trees; to Prohibit the Sale or Transportation of Citrus Fruit Containing Any Arsenic; and to Provide for Enforcement Thereof.

In 1925 the Mediterranean fruit fly made its appearance, and arsenic was the only effective poison known at that time for its control. Consequently, an amendment to the Arsenical Spray Law was approved June 29, 1929, giving the Federal Government and the Florida State Plant Board the right to use arsenic for the purpose of eradicating the fruit fly. The amendment prevented the enforcement of the law until January 1, 1931. Between 1929 and 1932 much investigational work was done by the Florida State Departmentt of Agriculture (3) to ascertain the effects of arsenicals on citrus fruits. It was found that the flavor of grapefruit apparently was not lowered by this spray, whereas the injudicious use of it on other citrus fruits caused a very marked decrease in total acid and produced flat, insipid, poor quality in some fruit. Therefore, as a result of these findings, in 1933 grapefruit was exempted from the Arsenical Spray Law (1, p. 113) through an " . . . injunction granted by Circuit Judge H. C. Petteway . . . and upheld by the Supreme Court, restraining the Department of Agricul-

1/ By Paul L. Harding, horticulturist, Division of Fruit and Vegetable Crops and Disease, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, at meeting of Florida State Horticultural Society.

ture from the enforcement of the Citrus Arsenical Spray in the Case of grapefruit," so that now this law is applied only to oranges and tangerines.

On this account comprehensive investigations were made to obtain more complete information on the effects of spraying in July with lead arsenate (usually at the rate of 1 pound to 100 gallons) on the composition and internal quality of Marsh and Duncan grapefruit. In tables 1 and 8 the physical characters and chemical constituents of these varieties on rough lemon and sour orange rootstocks when unsprayed and when sprayed with lead arsenate are directly compared, and the difference resulting from the spray are shown.

Material and Methods

The present study covered four seasons, 1939-40, 1940-41, 1941-42, and 1942-43. Analyses were made at four-week intervals on Marsh and Duncan varieties of grapefruit. Samples were taken at regular intervals from 27 different plots of trees sprayed with lead arsenate and from 27 comparable unsprayed plots. The spray was applied in July, many weeks prior to commercial harvest, at the rate of one pound of lead arsenate to 100 gallons of water. In order to include fruit in various stages of maturity and ripening, the analyses were started about the last week in August and continued until the middle of May of each season.

Experimental plots in commercial groves were selected so as to include groves located in the Central Ridge districts, where the soils are usually low in organic matter, in the East Coast and West Coast districts, where the soils have a higher organic-matter content, and in the Homestead-Rockdale district, where the soils are very rocky.

In each of these districts the plots were made up of Marsh and Duncan varieties on rough lemon and on sour orange rootstocks. The groves were in good physical condition and had been supplied with ample amounts of fertilizer.

The samples were taken to the laboratory at Orlando, Florida, immediately after they were picked and were placed at 32 degrees F. until tested. Each sample consisted

Table 1.—Effect of lead arsenate spray on the average weight of grapefruit at different picking periods, 1939-43.

(+ indicates that weight of sprayed fruit was greater than that of unsprayed;—that it was less)

Variety, rootstock and treatment	Weights Per Fruit									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.
Unsprayed	238	328	364	399	461	488	535	550	572	579
Sprayed	242	321	358	402	463	481	522	541	566	585
Difference	+4	—7	—6	+3	+2	—7	—13	—9	—6	+6
Marsh on sour orange:										
Unsprayed	210	286	336	393	461	488	521	556	521	561
Sprayed	200	266	316	378	431	467	495	511	487	554
Difference	—10	—20	—20	—15	—30	—21	—26	—45	—34	—7
Duncan on rough lemon:										
Unsprayed	323	392	437	485	549	603	641	662	704	716
Sprayed	312	389	430	478	524	592	615	633	677	684
Difference	—11	—3	—7	—7	—15	—11	—26	—29	—27	—32
Duncan on sour orange:										
Unsprayed	253	337	371	422	491	537	563	589	604	629
Sprayed	249	325	373	428	482	527	557	583	584	605
Difference	—4	—12	+2	+6	—9	—10	—6	—6	—20	—24

Table 2.—Effect of lead arsenic spray on the average volume of juice in 100 grams of grapefruit at different picking periods, 1939-43.

(+indicates that sprayed fruit contained a greater volume of juice than unsprayed;—a smaller volume.)

Variety, rootstock and treatment	Juice Per 100 Grams of Fruit									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:	Ml.	Ml.	Ml.	Ml.	Ml.	Ml.	Ml.	Ml.	Ml.	Ml.
Unsprayed	33	35	45	45	46	47	49	50	51	51
Sprayed	33	37	44	46	46	47	49	48	50	51
Difference	0	+2	—1	+1	0	0	0	—2	—1	0
Marsh on sour orange:										
Unsprayed	31	37	44	46	47	50	51	51	51	52
Sprayed	29	36	44	47	48	50	51	52	53	54
Difference	—2	—1	0	+1	+1	0	0	+1	+2	+2
Duncan on rough lemon:										
Unsprayed	30	34	43	44	44	46	46	46	47	48
Sprayed	32	37	43	44	45	45	46	46	47	48
Difference	+2	+3	0	0	+1	—1	0	0	0	0
Duncan on sour orange:										
Unsprayed	27	33	42	45	44	44	46	46	49	48
Sprayed	30	36	44	46	46	46	47	47	50	50
Difference	+3	+3	+2	+1	+2	+2	+1	+1	+1	+2

of 60 or more grapefruits picked at random from the 15 to 25 trees constituting each plot.

The juice was extracted from 25 fruits in most cases by an electric reamer and then strained through cheesecloth in order to remove seeds and pulp. Aliquots of this composited juice were used in the determination of the chemical constituents. The remaining fruits were used for taste tests as described in averaging the results obtained for the individual groves according to picking periods, and these findings are shown in tables 1 to 8. Detailed information is presented in another publication (2).

Results

Weight of fruit. The average weight of grapefruit was affected prior to harvest by one application of lead arsenate in the summer. The fruit of both the Marsh and the Marsh, and both kinds weighed more when on rough lemon rootstock than when on sour orange.

Volume of juice. The volume of juice in the fruit from sprayed Marsh and Duncan trees gradually increased with maturity and ripening just as it did in that from unsprayed trees. Lead arsenate spray did not significantly affect the volume when the data were computed on the basis of milliliters of juice per 100

Table 3.—Effect of lead arsenate spray on the average percentage of grapefruit that was juice at different picking periods, 1939-43.

(+ indicates that a greater percentage of sprayed fruit was juice than unsprayed; — a smaller percentage.)

Variety, rootstock and treatment	Juice per fruit									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Unsprayed	33	36	46	47	47	49	50	51	52	53
Sprayed	33	39	45	48	47	49	50	50	52	53
Difference	0	+3	−1	+1	0	0	0	−1	0	0
Marsh on sour orange:										
Unsprayed	32	38	45	48	49	52	53	52	52	55
Sprayed	30	37	45	49	50	51	52	54	55	56
Difference	−2	−1	0	+1	+1	−1	−1	+2	+3	+1
Duncan on rough lemon:										
Unsprayed	31	35	45	46	46	47	47	47	48	50
Sprayed	32	37	45	45	46	47	48	47	48	50
Difference	+1	+2	0	−1	0	0	+1	0	0	0
Duncan on sour orange:										
Unsprayed	29	34	44	46	47	48	49	49	51	52
Sprayed	31	37	45	48	48	46	48	48	51	50
Difference	+2	+3	+1	+2	+1	+2	+1	+1	0	+2

Table 4.—Effect of lead arsenate spray on the average ascorbic acid concentration per milliliter of grapefruit juice at different picking periods, 1939-43.

(+ indicates that ascorbic acid content in sprayed fruit was greater than in unsprayed; — that it was less.)

Variety, rootstock and treatment	Ascorbic acid per milliliter of juice									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:	Mg.	Mg.	Mg.	Mg.	Mg.	Mg.	Mg.	Mg.	Mg.	Mg.
Unsprayed	0.49	0.42	0.41	0.39	0.38	0.37	0.36	0.35	0.34	0.32
Sprayed	.50	.43	.41	.41	.39	.38	.37	.36	.34	.32
Difference	+.01	+.01	.00	+02	+.01	+.01	+.01	+.01	.00	.00
Marsh on sour orange:										
Unsprayed	.62	.51	.47	.44	.42	.42	.42	.42	.40	.37
Sprayed	.62	.49	.47	.46	.44	.42	.42	.43	.39	.37
Difference	.00	−.02	.00	+.02	+.02	.00	.00	+.01	−.01	.00
Duncan on rough lemon:										
Unsprayed	.50	.45	.44	.43	.42	.41	.40	.41	.40	.38
Sprayed	.49	.46	.45	.44	.43	.42	.42	.42	.40	.38
Difference	−.01	+.01	+.01	+.01	+.01	+.01	+.02	+.01	.00	.00
Duncan on sour orange:										
Unsprayed	.53	.46	.45	.44	.43	.43	.42	.42	.40	.38
Sprayed	.52	.46	.44	.44	.43	.43	.42	.42	.41	.39
Difference	−.01	.00	−.01	.00	.00	.00	.00	.00	+.01	+.01

U.S.D.A. Tech. Bul. 886 (2).

Official methods were followed in determining the chemical constituents.

The average values presented for weight of fruit, juice content, vitamin C, total solids, total acid, ratio of total solids to total acid, and palatability, were obtained by

Duncan varieties from the sprayed plots weighed slightly less than that from the unsprayed plots (table 1). It is interesting to observe that, both in sprayed and unsprayed fruit, variety and rootstock were factors which infulence the average weight per fruit. Duncan fruit had a greater average weight than the

gm. of fruit (table 2) or as percentage of the fruit that was juice (table 3). A very slightly greater volume of juice resulted when the Marsh fruits were from trees grown on sour orange rootstock than when from trees on rough lemon. The results were not conclusive in the case of Duncan fruit. Marsh fruit

from the sprayed trees contained a slight but consistently greater volume of juice than did fruit from similiarly sprayed Duncan trees.

Ascorbic acid (vitamin C). Spraying with lead arsenate in the summer did not lower the ascorbic acid concentration in the juice of grapefruit; in fact, the vitamin concentration in sprayed fruit was very slightly greater, but these results are probably not significant, as may be seen from the data given in table 4. They are of interest, however, since Nelson and Mottern (5) reported that the vitamin C content of oranges from trees sprayed with lead arsenate was found to be considerably lower than that of oranges from unsprayed trees of the same variety and the same degree of maturity. As with fruit from unsprayed trees, the highest average concentrations of ascorbic acid were found in immature Marsh and Duncan grapefruit. As the fruit ripened the milligrams of juice gradually decreased and the lowest values were found late in the season in very ripe fruit.

Rootstock and variety affected the ancorbic acid content of the fruit. The Marsh grapefruit on sour orange rootstock contained a slightly greater concentration than on rough lemon. Comparisons between varieties indicated slightly higher ascorbic acid values in the Duncan than in the Marsh fruit.

Total solids. Spraying with lead arsenate did not greatly affect the total solids content of the fruit, as shown in table 5 where the increases or decreases caused by spraying have been computed. The differences associated with spraying were not consistent. The results herein presented are in general agreement with the findings of Miller, Bassett, and Yothers (4), who showed that the total solids of fruit juice were somewhat increased when as little as 0.008 mg. of arsenic trioxide was present on the leaves at the time the fruit reached maturity, but that solids decreased when more than this was present.

Table 5, indicates that values for total solids were generally highest when the sprayed grapefruit was in prime eating condition. Slightly lower solids were usually found earlier in the season in immature

Table 5.—Effect of lead arsenate on the average total solids content of grapefruit at different picking periods, 1939-43.

(+ indicates that total solids content in sprayed fruit was greater than in unsprayed; − that it was less.)

Variety, rootstock and treatment	Total Solids									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Unsprayed	9.21	9.11	9.46	9.79	9.85	9.60	9.49	9.40	9.24	9.01
Sprayed	9.13	8.97	9.55	9.97	9.89	9.61	9.60	9.44	9.14	8.83
Difference	−.08	−.14	+.09	+.18	+.04	+.01	+.11	+.04	−.10	−.18
Marsh on sour orange:										
Unsprayed	10.42	10.35	10.86	11.19	11.42	11.15	11.44	11.37	11.03	10.85
Sprayed	10.81	10.39	11.10	11.29	11.39	11.09	11.36	11.45	10.77	10.71
Difference	+.39	+.04	+.24	+.10	−.03	−.06	−.08	+.08	−.26	−.14
Duncan on rough lemon:										
Unsprayed	8.98	9.07	9.94	10.42	10.59	10.35	10.42	10.50	10.17	10.12
Sprayed	9.10	9.15	9.75	10.43	10.44	10.38	10.46	10.41	10.22	10.17
Difference	+.12	+.08	−.19	+.01	−.15	+.03	+.04	−.09	+.05	+.05
Duncan on sour orange:										
Unsprayed	10.59	10.50	11.17	11.99	12.29	12.03	12.43	12.41	12.28	12.32
Sprayed	10.78	10.75	11.34	11.93	12.32	12.21	12.53	12.72	12.54	12.08
Difference	+.19	+.25	+.17	−.06	+.03	+.21	+.10	+.31	+.26	−.24

Table 6.—Effect of lead arsenate spray on the average total acid of grapefruit at different picking periods, 1939-43.

(− indicates that total acid was less in sprayed fruit than in unsprayed.)

Variety, rootstock and treatment	Total acidity									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Unsprayed	1.86	1.48	1.55	1.52	1.45	1.38	1.29	1.23	1.14	1.01
Sprayed	1.73	1.37	1.37	1.33	1.25	1.15	1.12	1.04	.92	.80
Difference	−.13	−.11	−.18	−.19	−.20	−.23	−.17	−.19	−.22	−.21
Marsh on sour orange.										
Unsprayed	2.05	1.63	1.68	1.60	1.47	1.44	1.39	1.31	1.18	1.14
Sprayed	1.86	1.51	1.53	1.39	1.30	1.19	1.16	1.10	.95	.84
Difference	−.19	−.12	−.15	−.21	−.17	−.25	−.23	−.21	−.23	−.30
Duncan on rough lemon:										
Unsprayed	1.81	1.55	1.62	1.61	1.56	1.52	1.47	1.44	1.32	1.23
Sprayed	1.67	1.39	1.43	1.38	1.35	1.27	1.24	1.13	1.06	.97
Difference	−.14	−.16	−.19	−.23	−.21	−.25	−.23	−.31	−.26	−.26
Duncan on sour orange:										
Unsprayed	2.06	1.83	1.97	1.97	1.93	1.81	1.78	1.68	1.63	1.53
Sprayed	1.97	1.65	1.71	1.69	1.59	1.54	1.45	1.42	1.29	1.21
Difference	−.09	−.18	−.26	−.28	−.34	−.27	−.33	−.26	−.34	−.32

fruit and also late in the season in very ripe fruit. The data indicate that the rising gradient was more pronounced in Duncan than in the Marsh fruit due in some measure to the higher maximum values for the former. Duncan had greater total solids content than did Marsh.

Rootstock on which the sprayed grapefruit was grown affected the total solids of the fruit, both the Marsh and the Duncan fruit containing greater amounts when on sour orange rootstock than on rough lemon.

Total acid. Spraying with lead arsenate significantly affected the acid content of the fruit at all picking periods (table 6). Tests made on immature fruit picked about September 1 showed that the lead arsenate spray reduced the acidity about 4 to 9 percent, relatively, below that of unsprayed fruit. In the very ripe fruit picked in May the total acid of the sprayed fruit was reduced about 21 to 26 percent. The effect of lead arsenate on the total acid content of the fruit therefore appears to be progressive, the differences becoming greater as the fruit ripens. It is apparent that the total acid in both sprayed and unsprayed fruit decreased regularly with maturity and ripening, as is shown by the average values in table 6.

These findings are in agreement with those of Miller, Bassett, and Yothers (4), who found that when arsenic was present on the leaves not so much acid was found in the fruit and what was formed disappeared more rapidly than it did in unsprayed fruit.

It will also be noted in table 6 that the rootstock on which the sprayed trees were grown affected the total acid and that both the Marsh and the Duncan grapefruit on sour orange rootstock contained a higher percentage of total acid than those produced on rough lemon; the Duncan variety had a slightly greater total acid content than did the Marsh.

Ratio of total solids to total acid. Table 7 shows the ratios of total solids to total acid. These data were calculated from the average values obtained for total solids (table 5) and for total acid (table 6).

(Continued on page 16)

Table 7.—Effect of lead arsenate spray on the average ratios of total solids to acid in grapefruit at different picking periods, 1939-43

(+ indicates that the total solids-to-acid ratio was greater in sprayed fruit than in unsprayed.)

Variety, rootstock and treatment	Solids-acid ratio									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:										
Unsprayed	4.95	6.16	6.10	6.44	6.79	6.96	7.36	7.64	8.11	8.92
Sprayed	5.28	6.55	6.97	7.50	7.91	8.36	8.57	9.08	9.93	11.04
Difference	+.33	+.39	+.87	+1.06	+1.12	+1.40	+1.21	+1.44	+1.82	+2.12
Marsh on sour orange:										
Unsprayed	5.08	6.35	6.46	6.99	7.77	7.74	8.23	8.68	9.35	9.52
Sprayed	5.81	6.88	7.25	8.12	8.76	9.32	9.79	10.41	11.34	12.75
Difference	+.73	+.53	+.79	+1.13	+.99	+1.58	+1.56	+1.73	+1.99	+3.23
Duncan on rough lemon:										
Unsprayed	4.96	5.85	6.14	6.47	6.79	6.81	7.09	7.29	7.70	8.23
Sprayed	5.45	6.58	6.82	7.56	7.73	8.17	8.44	9.21	9.64	10.48
Difference	+.49	+.73	+.68	+1.09	+.94	+1.36	+1.35	+1.92	+1.94	+2.25
Duncan on sour orange:										
Unsprayed	5.14	5.74	5.67	6.09	6.37	6.65	6.98	7.39	7.53	8.05
Sprayed	5.47	6.52	6.63	7.06	7.75	7.95	8.64	8.96	9.72	9.98
Difference	+.33	+.78	+.96	+.97	+1.38	+1.30	+1.66	+1.57	+2.19	+1.93

Table 8.—Effect of lead arsenate spray on the average palatability as indicated by numerical ratings of grapefruit at different picking periods, 1939-43.

(+ indicates increase in palatability in sprayed fruit; — decrease in palatability.)

Variety, rootstock and treatment	Numerical ratings (palatability)									
	Aug. 25–Sept. 2	Sept. 25–30	Oct. 23–28	Nov. 20–25	Dec. 18–23	Jan. 15–20	Feb. 12–17	Mar. 11–16	Apr. 7–13	May 6–11
Marsh on rough lemon:										
Unsprayed	20	32	54	60	62	69	77	81	83	85
Sprayed	20	32	55	65	68	74	80	83	85	86
Difference	0	0	+1	+5	+6	+5	+3	+2	+2	+1
Marsh on sour orange:										
Unsprayed	20	34	52	62	69	76	82	87	87	92
Sprayed	20	34	52	67	69	79	85	89	89	85
Difference	0	+2	−2	+5	0	+3	+3	+2	+2	−7
Duncan on rough lemon:										
Unsprayed	20	35	54	62	65	71	78	81	84	86
Sprayed	20	39	59	67	69	75	82	84	87	87
Difference	0	+4	+5	+5	+4	+4	+4	+3	+3	+1
Duncan on sour orange:										
Unsprayed	20	35	55	61	65	73	81	86	87	88
Sprayed	20	38	54	68	72	80	85	89	91	91
Difference	0	+3	−1	+7	+7	+7	+4	+3	+4	+3

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ANDREWS—HOLLAND

In the death of Senator Charles O. Andrews, Florida loses an able, conscientious and diligent worker for his state; the citrus growers of Florida lose a good friend and an alert ally. Himself a grove owner, Senator Andrews was ever alive to the interests of the industry. Largely through his efforts, carried on through a period of years, the Senate finally approved a measure to reimburse Florida growers to the extent of ten million dollars for losses sustained in the eradication of the Mediterranean fruit fly. Other measures affecting the industry had his hearty approval and active support.

Able, alert, diligent; modest, clear-headed, liberal; neither too far to the left nor too far to the right, he wielded an unusual influence in the Senate and held the respect and admiration of his fellow members of that body. He was loved and revered by the thousands of Floridians who recognized his ability and venerated his character. In his death Florida loses a noble character and an able public servant.

In the appointment of Spessard L. Holland to succeed to the unexpired term of the late Senator Andrews, Governor Caldwell did the logical thing and earned the approval of the citizens of Florida. In his public life, in his service as a member of the state legislature, later as governor with an outstanding record, he has won the confidence and esteem of his fellow Floridians. He goes to the Senate with that confidence and esteem unimpaired.

Like his predecessor in office, Senator Holland is a citrus grower in his own right. Through long association with citrus organizations he has gained an intimate knowledge of the needs and requirements of the industry. Like his predecessor, he is clear-headed, conscientious, diligent; liberal in thought (but not too liberal) and a powerful exponent of the things in which he believes.

In the death of Senator Andrews, Florida and the Florida citrus industry has lost a good friend; in Senator Holland, Florida and the Florida citrus industry has a friend equally able, equally alert and even more aggressive.

BIG CROP IN SIGHT

Florida citrus growers are now busy harvesting what probably will prove to be the biggest crop of citrus fruits ever grown in the state. Based upon Federal estimates, which in the past have proven pretty accurate, and backed by the judgment of experienced grove men, the crop now on the trees will exceed by far that of last season which amounted to 86,000,000 boxes and brought citrus growers $160,000,000.

The orange crop is exceptionally heavy; seedless grapefruit and tangerines are producing extremely well; only in the seeded varieties of grapefruit is there a falling off from last season's production. Even in this latter variety, sizes are above normal which will go far toward making up for the smaller number of fruit per tree.

The crop is maturing much earlier than a year ago and sizing up well. Shipments of early grapefruit began about the middle of the month and are going forward in considerable volume. By the time this issue reaches its readers, it is probable that some early oranges will be on the way to market.

Prices received for early shipments of grapefruit were very satisfactory, but there has been some decline during the past week or ten days. If properly handled and controlled, the big crop should be marketed at profitable prices to the growers.

SMALL SIZES BARRED

The Federal citrus marketing control committees in a recent meeting at Lakeland, decided to continue the present ruling in regard to size of citrus fruits going to the fresh fruit markets. The only exception to his rule is that pink grapefruit of size 126 and larger may be shipped, if grading No. 2 or better.

The present rule permits the shipment of oranges of size 250 or larger; seeded grapefruit of 80 or larger, and seedless grapefruit of 96 and larger; tangerines of 246 and larger, all of grade 2 or better.

With these restrictions in force, only fruit of good size and grade may be shipped until further rulings are made by the control committees. This should have a favorable effect on the market and result in the stabilization of prices.

With a short crop of seeded grapefruit and with canners active in buying up the crop at attractive prices, the demand for the seedless varieties should be accelerated.

Florida citrus canners are expanding their field of operations. Floridagold Citrus Corporation, with heaquarteers at Lake Alfred. has just purchased the plant of the Texas Food Products Co., at Mission, Texas. Floridagold has canneries at Lake Alfred, Dundee and Eagle Lake, Florida.

Some Factors Influencing Citrus Fruit Decay Experiments

K. W. LOUCKS AND E. F. HOPKINS(1),

Citrus Experiment Station, Lake Alfred Florida

Delivered at Meeting of Florida State Horticultural Society

It has been known for many years that the principal storage decays of Florida citrus fruits are the stem-end rots and Penicillium molds. The taxonomy and morphology of the casual organisms **Diplodia natalensis** Evans. **Phomosis Citri** Faws., **Penicillium digitatum** Sacc., and **Penicillium italicum** Wehmer have been very thoroughly studied. Some facts have been discovered about their physiological requirements in relation to their host but essentially nothing about their actual control from a commercial point of view. While such experimental work has been done in previous years, there appears to be at the present time a greater interest in the problem. This is perhaps due to better organization in the citrus industry and to a greater realization of the economic importance of losses caused by stem-end rot and Penicillium molds. High market values of citrus fruits may also be a factor. The recent discovery of Childs and Siegler (1,2) that treatment of the fruit with a solution of thiourea is very effective in preventing rots and molds has served to further stimulate investigations in this field.

For the past 3-1/2 years the authors have carried on extensive experiments for the purpose of developing practical methods of decay control for use in packinghouse. In the course of their investigations it became evident that before the effect of a treatment, either chemical, mechanical, or otherwise, could be evaluated, some means must be devised whereby the results of their experiments could be correctly judged. This was imperative because of the fact that fruits from the same tree varied in their response to decay. It was found that fruit from different sources, especially between magnesium deficient trees and those well fertilized with this element varied considerably in their natural amount of decay. Fruit from different varieties or from different groves having the same cultural treatment, all showed wide variation in the mounts of **decay which** developed when held at comparable storage conditions (3). Then too, the temperature and humidity of the storage rooms appeared to be a factor in the amount of decay which developed. All of these factors tend to make it very difficult to satisfactorily interpret the results of any given experiment unless it is designed in such a way as to evaluate the degree of natural variation that is occuring in the fruit and over which there is no experimental control. Fortunately there are methods of designing experiments in such a manner that this variation may be estimated. One of these methods, known as the analysis of variance (7) has been used during the past two years or more to evaluate the results of the most of our experiments.

Analysis of variance for a typical experiment is given in Table 1. In each treatment 100 oranges divided into 4 lots of 25 each were used and the number of decayed fruits in each lot recorded. In treatments 2, 4, and 6 thiourea was applied in different ways and the fruit processed in the packinghouse machine. Treatments 3, 5 and 7 correspond to 2, 4 and 6 respectively but were given a more thorough rinsing with warm water after the washer. Number 1 is the untreated check. This analysis shows that there was a significant reduction in decay caused by all of the treatments with thiourea when compared with the check. It is also evident that more thorough rinsing after treatment 2 (i. e. treatment 3) did not increase the amount of decay, while for treatments 4 and 6 this was not true. The increases from 1% to 14% and from 3% to 13% are significant if the 5% level of

Figure 2. Effect of 10% thiourea on soaking, scrubbing, and color add sections of the packinghouse process. Amount of decay during 2 weeks in storage from treated box is shown on the left and from untreated regular packed box on the right.

1. Work done at the Citrus Experiment Station, Lake Alfred, Florida on funds provided by the Florida Citrus Commission, Lakeland, Florida.

probability is taken, but scarcely significant if as high a certainity as the 1% level is desired. The corresponding least difference necessary for significance at the 1% level would be 10.2% instead of 7.6%.

From many tests during the past year the least difference necessary for significance at the 5% level of probability between lots of 100 fruit each in the amount of stem-end rot that developed in 3 weeks of storage has ranged from 5.8% to 15% with an average of 8.1%. From these observations it is apparent that if the experiments are not set up in such a way as to lend themselves to statistical analysis one must look for a difference of at least 12 to 15% between the percentages of stem-end rot which develops in three weeks among treatments applied to lots of 100 fruit each and randomized between themselves before that difference can be considered. If no randomization is possible even greater differences must be obtained before they can be definitely assumed to be significant.

When it was found possible to interpret results from individual experiments many tests were made to try to answer such questions as what, when and how certain chemicals might be applied to the fruit or what mechanical means might be used to reduce decay. It has been pointed out by Hopkins, Loucks and Stearns (4) that the packinghouse process as exemplified by tests from 6 different packing houses did not affect the amount of decay that developed during three weeks in storage. Hopkins and Loucks (5) showed that picking of the fruit by pulling did not increase the amount of decay over that produced by clipping. It was found that the removal of the buttons after they had been loosened by treating the fruit with ethylene gas, removal of the calym by pulling the fruit from the tree, or debuttoning by certain mechanical means did not decrease the amount of stem-end rot, (4).

One of the paradoxes of these investigations is the fact that certain known fungicides actually increase the development of stem-end rot instead of reducing it. A typical result of soaking freshly picked fruit in solutions of CuSO4 or NaOcI is shown by the average of two experiments in Table 2.

Other chemicals which increased the development of stem-end rot are sodium thiosulphate 1% or 5%, ethylene gas 1/10,000 for 48 hours, and Acetylene 1/10,000 for 48 to 72 hours.

A combination of copper sulphate and sodium thiosulphate increased the amount of stem-end rot in fruit obtained from two different locations even though the amount of copper used was very small. In Table 3 is shown the rot-stimulating effect of copper sulphate and sodium thiosulphate.

In order to test the antagonistic value of thiourea against the increase of stem-end rot by a mixture of 0.1% copper sulphate and 1.0% sodium thiosulphate a test was made using this mixture as a dip for 6 hours followed by a 5 minute dip in a 5% thiourea solution which was allowed to dry on without rinsing. The data in Table 4 show that the copper mixture greatly increased the amount of stem-end rot over that in the untreated check 74% against 32% at 3 weeks. The combination of copper mixture followed by the thiourea prevented the development of any stem-end rot.

The results from certain experiments indicate that some of the natural products of metabelism of stored citrus fruits increases the amount of stem-end rot. Since it is known that ethylene gas increased stem-end rot and ethylene is one of the products of metabolism, an experiment was set up to determine if the removal of this or some

TABLE 1

Showing the number of decayed fruit which occurred in each lot of 25 and the values found by analysis of variances.

Replications	Treatment 1	2	3	4	5	6	7
A	10	0	0	0	5	1	4
B	9	1	1	0	2	1	3
C	5	0	0	1	5	1	2
D	10	1	2	0	2	0	4
Sum of decayed fruit	34	2	3	1	14	3	13

Source of variance	Degrees of freedom	Sum of Squares	Mesa Squares	Calculated F value	Needed F value for significance
Total	27	245			
Treatments	6	211	35.2	21.7	(2.55 @ 5% level
Error	21	34	1.62		(3.76 @ 1% level

Least difference necessary for significance - V$\frac{1.62x2}{4}$ x t- 0.9x2080-187 or x 4-

7.6% @ 5% level -0.9x2.831-2.55 or x4-10.2 for 1% level.

TABLE 2

Showing the stimulating effect of certain chemicals on the development of stem-end rot.

Treatment	% of Ser after 3 wks.
Check	48
Copper sulphate 0.1%	56
Sodium Hypochlorite 0.05%	78

TABLE 3

The stimulating effect of copper suplhate and sodium thiosulphate on SER of fruit from 2 different locations.

Solution	% SER after 3 wks. Fruit from location 1	2
0.1% CuS04, 5H20x 1.0% Na2, S203	72	54
0.05% CuSO4, 5H20x 1.0% Na2, S2O3	64	42
Check — No Treatment	14	10

TABLE 4

Showing the antagonistic effect of thiourea against copper for increasing the development of stem-end rot.

Treatment	Amt. of SER after 1 wk	2 wks.	3 wks.	4 wks.
Check	0	18	32	36
0.5% CuSO4-1.0% Na2S203	34	68	74	80
Same followed by 5% thiourea	0	0	0	0

other gas would be effective in reducing the rots.

One lot of fruit was sealed in a 50 gallon drum, another was placed in a drum in which the air was circulated over potassium permanganate and potassium hydroxide to absorb the ethylene, carbon dioxide and perhaps other gases. A third lot of fruit was held in ordinary storage. The results are shown in Table 5 which indicates that the removal of metabolic products is important in controlling stem-end rot.

Various methods of storing fruit

TABLE 5

Effect of removing metabolic products.

Treatment	% SER after 3 wks.
Closed drum	54
Closed drum xKMn2O4 xKOH	10
Check ordinary storage	12

that would naturally allow varying accumulations of ethylene or other metabolic products were treated and Table 6 shows that the type of storage providing the most ventilation and which most effectively removed these products is the best from a control standpoint. In this connection it should be mentioned that by immediately sealing the stem of clipped fruit by parafin which would retard or prevent the exchange of gases through the stem-tissues, the development of stem-end rot was greatly increased.

Another experiment was set up to test the suggestion that fruit picked by clipping with dull clippers developed more rot than fruit which is picked by cutting the stem with a very sharp knife. The results showed that the fruit picked by cutting developed enough less stem-end rot than those picked by the dull clippers to be just on the borderline of significance. The stem tissues crushed by the clippers may have formed more of a blockage to the free passing of gases through the stem end than did the tissue which was cut by the sharp knife and not crushed.

Activated carbon which was saturated with bromine was very effective in controlling stem-end rot when placed in cloth pads and enclosed in packed boxes of oranges. Under the circumstances of the tests, the molds were slightly increased, but it is believed that by more refined methods this harmful effect could be eliminated. The results from one experiment are shown in Table 7 where stem-end rot was reduced by activated carbon saturated with either bromine or chlorine.

TABLE 6

Results obtained by varying to degree of ventilation in storage space.

Type of storage	% SER after 3 wks
Sealed in drum	80
Drum covered with cheesecloth	54
Commercial storage, with air circulated	36
Ventilated drum	36
On trays in large open room	24

Results from the above mentioned experiments uphold the theory that something in the metabolic process hastens the development of stem-end rot and that anything which reduces the accumulation of metabolic products, possibly ethylene, will retard the development of rots. In this connection since the movement of oxygen into and from the stem tissue was modified by all of these tests, the possibility of these results being associated with an exidation-reduction interaction was considered. However, oranges treated with various oxidizing agents developed as much rot as untreated. Attempts at toning the rind physiologically to make the fruit more resistant to rots by the use of various ions such as Ca, H, Fe, Mn, Al, and Zn were unsuccessful.

It has been known for a long time that if the buttons can be removed from the citrus fruits their predilection to stem-end rot was

TABLE 7

Decrease in SER caused by activated carbon fortified with bromine or chlorine.

Treatment	% SER during 2 wks storage
Check	10
Activated carbon	17
Activated Carbon x Bromine	0.8
Activated Carbon x Chlorine	6

greatly reduced. Because the removal of buttons involves a great amount of labor, methods were tested that might loosen the buttons enough that they would be rubbed off by the regular packing-house machinery brushes. Fruits were soaked with various hormones and other chemicals to no avail. Gassing with various materials seemed to give some promise so a tensiometer was used to record the relative tension necessary to pull buttons from oranges after they had been treated with various gases. It was found that these gases were effective in causing the buttons to loosen in the following order; ethylene the most effective and ether the least; ethylene

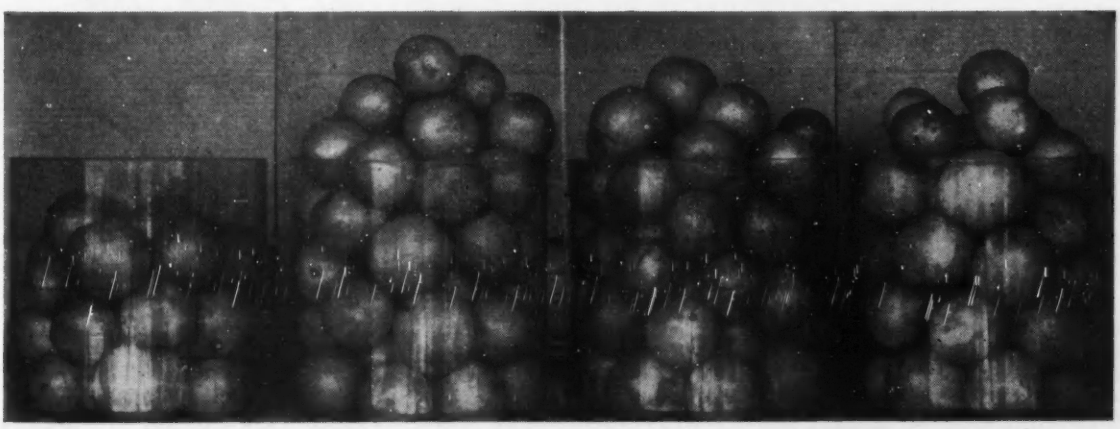

Figure 1. Reduction of decay obtained by painting the buttons with various chemicals. Sound fruit remaining after 5 weeks in storage. Check, no treatment, merthiolate, S-hydroxyliquinoie sulfate, thiourea.

1:5000, acetylene 1:5000, chloroform 1:100, benzine 1:123, carbon tetrachloride 1:138, toluene 1:150 and ether 1:146. Approximately six times as much pull was required to remove the buttons from fruit treated with ether as from those treated with ethylene. So long as the fruit is picked by pulling as it is at present, no means of removing the buttons by the brushes will be possible. In fact, a sufficient number of buttons clipped with short stems and gassed with ethylene were not removed on the branches to give a commercial contro of stem-end rot.

It would be necessary to cut the stems longer than is best from the stem-puncture injury standpoint. Until some means is devised for economical removal of the buttons this method of control appears to be ruled out.

Approximately 75 chemicals were tested for their fungicidal action against the four organisms involved in this discussion by incorporating them in agar plates inocculated with the fungi. Among them the following were found to be effective in controlling one or more of the organisms in culture: S-hydroxyquinoline, chlerothymol, thymol copper sulphate, allyl isothiocyanate, cupferron, and S-hydroxyquinoline sulphate when used at concentrations of 500 ppm. Thiourea was effective at concentration of 3 %. When these chemicals were used as a dip or in conjunction with wax, thiourea was the only one which was effective in controlling the fruit rots. As mentioned before, copper sulphate actually increased the amount of rot.

The above results indicate that culture tests to determine the effectiveness of chemicals in controlling rots on citrus fruits are not practical. It was discovered that a drop of a chemical in solution placed on the buttons of the fruit is a more reliable means of quickly and cheaply testing the efficacy of the chemical (6). Approximately 50 chemicals have been so tested and the following have given good results:: merthiolates, thiourea, S-hydroxyquinoline sulphate, 2, 4, diamino diphenylemine, S-hydroxyquinolinesulphate, 2, 4, diamino diphenylomine, S-hydroxyquinoline base in oil 2 methyl 1, 4-napthoquinone, naphthol, phenyl mercuric ascetate, phenyl mercuri triethenol, ammonium lactate, and thiosemicarbazide. In Figure 1 is shown the amount of sound fruit remaining after 5 weeks, when comparing those having buttons painted with certain chemicals against those that were not painted.

Not all of those compounds have been further tested to discover their effectiveness when applied in some manner which is commercially poss ble. Many of the S-hydrozquinoline derivatives have been tried but consistently good results have not been obtained by any method used so far. It has been used mostly in the sulphate form because it is most soluble. Thiourea has been tested very extensively and has been found to control the rots effectively when the fruit was subjected to a 10% solution for 6 to 10 minutes. An increase in temperathre of the treating bath to 55°C improved the efficiency of the treatment as did also a hot treatment in a 25% solution for 2 minutes or a thirty second submersion in a 10% solution at room temperature and the fruit allowed to stand for 1 hour before the thiourea was waashed off. The use of thiourea is prohibited at the present time because its toxic effect on humans is not yet known.

A few proprietory materials that have been supplied by their distributors have been given very thorough tests for their ability to control rots. Paper mats containing some ammonium compound, were found to give no control over stem-end rot or molds when 8 to 24 wafers were placed in a packed box of oranges. Various green paper wraps, were extensively tested on oranges and grapefruit for their ability to control storage diseases in lighted and darkened storage rooms. They were found to have no effect on the diseases and shrinkage was just as great in the green wraps as it was in the light orange colored paper wraps that are commonly used for wrapping citrus.

Two opoxides, ethylene oxide and propylene oxide which were tried as fumigants proved ineffective at any concentration that was low enough to be harmless to the fruit rind.

Although at the present time no useable chemical has been found that is highly effective against citrus storage rots by any of the methods so far used, and that is cheap enough to be profitable and whose toxicity to humans is known, the results reported here seem very hopeful that such a compound can be discovered.

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There were 16,000 accidental deaths and 1,500,000 non-fatal injuries to American grove and farm people during 1945.

Lupine---A Great Cover Crop

W. E. STOKES
Agronomist, Florida Experiment Station

Florida's soils are sandy and low in natural fertility, so we have to use commercial fertilizer and organic matter in the form of stable fertilizer or green cover crops such as grass, weeds cowpeas, beggarweed, velvet beans, and crotalaria that are turned back to the land for soil enrichment.

It is not very difficult to grow summer cover and green manure crops since grasses, weeds, beggarweed, and crotalaria volunteer freely after cultivatiton ceases and grow well during the summer rainy period. The growing of winter cover crops, however, absolutely requires the seeding of the crop each fall, and the crop must be grown during our driest period of the year. The winter cover crop must make worthwhile growth early enough to allow for planting succeeding crops at the proper time.

Until recent years vetches and Austrian peas were our principal winter cover and green manure crops. However, these crops do not seed satisfactorily in the south, so seed must always be purchased elsewhere, making it difficult to always get adequate seed at satisfactory prices.

In the early 1930's the Florida experiment Station, in cooperation with the U. S. Department of Agriculture, began testing various species of lupines, and by 1938 our North Florida Experiment Station at Quincy and developed seed supplies of Blue lupine for distribution, through the Agricultural Extension Service, for trial plantings throughout the state. Since that time, the growing of blue lupine has increased rapidly, particularly in North Florida, Alabama, and Georgia. This is evidenced by the fact that, according to the U. S. Crop Reporting Service, the pounds of seed harvested in Florida, Georgia, and Alabama was 5,100,000 in 1943, 7,100,000 in 1944, and 11,200,000 in 1945.

The reasons for the popularity and rapid increase in acreage of blue lupine in Florida, Georgia, and Alabama are adaptability of the crop, good seeding habits, and its ability to produce satisfactory tonnage of green manure early enough to allow the crop to be turned under in time to plant other crops behind it **on time.**

Many farmers as well as the Experiment Stations are finding that crops grown following blue lupine yield much better than crops grown where no lupine was grown and that little or no commercial nitrogen is needed on crops following blue lupine. In addition, many are **combining** lupine seed and selling them at a good profit

EFFECT OF LEAD ARSENATE SPRAY ON THE SEASONAL CHANGES IN FLORIDA GRAPEFRUIT.

(Continued from page 9)

For both sprayed and unsprayed fruit the ratio of solids to acid generally increased with maturity and ripening of the fruit. This increase was primarily due to the consistent decrease in the total acid, since the solids were generally highest when the grapefruit was in prime eating condition and lower in immature and also in very ripe fruit.

Spraying with lead arsenate hastened the rate of lowering of acidity of the grapefruit, which resulted in higher ratios of solids to acid at an earlier date and consequently in an earlier attainment of legal maturity than in the case of unsprayed fruit. According to these data the sprayed grapefruit passed the legal ratio requirement from 1 to about 4 months earlier than the unsprayed fruit. Table 7 indicates that the sprayed fruit passed the legal ratio requirement between September 25 and October 28, whereas the unspreyad fruit passed the legal solids to acid requirement between October 23 and January 20.

In the Marsh variety the fruit from the unsprayed and sprayed trees on sour orange rootstock passed the legal solids to acid ratio requirement earlier than did comparable fruit on rough lemon rootstock, while in the Duncan variety such differences due to rootstock were not always consistent. More extensive comparisons of ratios of total solids to total acid as affected by spraying with lead arsenate are presented in another publication (2).

Palatability of fruit. The eating quality of the sprayed and unsprayed fruit was evaluated according to the method and the arbitrary standard scale described in another publication (2). The averages presented in table 8 are fairly consistent throughout the period of sampling and showed a gradual increase in the eating quality of grapefruit with ripening. The lower acidity caused by spraying with lead arsenate resulted in a more palatable fruit, as shown by the higher numerical ratings in comparison with those attained by fruit not sprayed with lead arsenate. The differences in palatability due to this spray are more definitely brought out in table 8, which shows the progressive changes resulting from this treatment.

Immature, unpalatable fruit was rated below 70, while the qualification for consumer acceptability was a rating of from 80 to 100. On this basis the unsprayed grapefruit in this test met consumer approval by about January 15, with most of the fruit approaching this standard about a month earlier. From January into May the degree of palatability gradually increased. The slightly higher numerical values shown for the sprayed fruit indicated an earlier consumer approval and a general preference for it as compared with the unsprayed fruit.

The data obtained on palatability do not support very closely present legal maturity ratio standars. The data on palatability shown in table 8 indicate that the present ratio requirement permits the shipment of sour fruit regarded by the taste judges as below the standard of acceptability for fruit to which no sugar had been added.

The findings show that rootstock influenced the eating quality of the sprayed and unsprayed fruit. It may be noted that both Marsh and Duncan fruit had higher numerical palatability ratings when they were grown on sour orange rootstock than when on rough lemon. The ratings differed slightly for the two varieties, the Duncan usually being rated higher than the Marsh; the differences in the averages though small, are statistically significant.

Summary

Spraying the grapefruit trees and fruit in July with one application of lead arsenate (at the rate of 1 pound of lead arsenate to 100 gallons of water, the concentration commonly used commercially), brought about a significant reduction in total acid. The total acid of immature sprayed fruit was about 4 to 9 percent below that of the unsprayed, and that of very ripe sprayed fruit was as much as 21 to 26 percent less than for unsprayed fruit. The lowering of the acidity by spraying with lead arsenate resulted in higher ratios of total solids to total acid; this, in turn, resulted in earlier maturity, as judged by present legal standards, and more palatable fruit, as shown by the higher average num-

erical taste ratings. On the other hand, spraying resulted in a slight decrease in the weight of the fruit and correspondingly in its size. It did not, however, significantly lower the volume of juice computed on a percentage basis or as milliliters of juice per 100 gm. of fruit, neither did it affect the concentration of ascorbic acid or the total solids.

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Florida farmers can still earn payments for carrying out a number of conservation practices in 1946.

The LYONIZER

Department

COMPILED BY THE LYONS FERTILIZER CO.

Reports Of Our Field Men . . .

SOUTHWEST FLORIDA

Eaves Allison

Satisfactory rains have continued to maintain favorable moisture conditions during the past thirty days. Fruit is sizing up well and in some groves grapefruit is beginning to show a definite break in color. Movement of fruit is now getting under way, with grapefruit being packed by a number of houses. Oranges will start moving at an early date and during the season this section will ship some excellent fruit to the market. Groves that received a part of their fertilizer late in July or early August have shown good response, with the trees in better than average condition. Truck farmers and gladioli growers are busy with their fall planting programs and the outlook for the season at this time is very good.

POLK COUNTY

J. M. (Jim) Sample

This County is again under way with the hustle and bustle of getting a fruit crop moved to market. A number of packing houses started shipping grapefruit about the middle of September and now we are going along at a good speed in moving one of the finest quality crops ever produced in this section. During the summer months growers utilized a great deal of the packing house labor in pruning and other jobs and as a whole groves in this county are in excellent condition, our fertilizer program is well under way and as usual adequate amounts of secondary elements are being added as a supplement to the regular mixtures. This is of course as it should be if we are to maintain our high production. Common grapefruit is somewhat light in this section but good prices are being offered for this variety of fruit which will to some extent compensate the grower for his light crop.

NORTH CENTRAL FLORIDA

V. E. (Val) Bourland

For the first time in several years we have had adequate rains this summer that were well distributed as far as any drought was concerned and as a result we have our groves in excellent condition and carrying a very fine crop of real quality fruit. We are moving some grapefruit to market at this time and it is expected that oranges will start moving at an early date. We did some early fertilization this fall and the application will be continued on into December. We have had a constant fight with rust mite and other pests during the past few months but the damage from insects and diseases have been kept to a minimum. Vegetable growers in the Winter Garden and Zellwood areas are planting for the fall operations and in many instances plantings have already gotten under way. Seed beds are in excellent condition and it is expected that we will have a very fine crop of excellent quality.

WEST CENTRAL FLORIDA

E. A. (Mac) McCartney

Citrus groves in this section are in better condition than we have seen them in a long time and this is true in spite of the fact that we have been unable to supply our growers with as much organic nitrogen as they have wanted. We have known for a long time that with the use of the various secondary elements that if necessary we could get along with a great deal less of organic nitrogen and these war time requirements have proven this very conclusively. However, we still maintain that with a well balanced high organic fertilizer, and through the use of the secondaries that we have increased our production over the yield that we are getting today. Vegetable growers in this section are getting ready for a bumper crop this season. Their seed beds are in excellent conditions and in many instances plantings are already under way.

HILLSBOROUGH & PINELLAS COUNTIES

C. S. (Charlie) Little

This territory is a very heavy grapefruit producing territory and we have a large acreage planted to seeded varieties of grapefruit which means that our grapefruit tonnage will be light. There is one consolation in the fact that the sizes will be very good and that the quality is very good. Our orange crop is excellent, and most growers feel that they have some of the finest quality that they have produced in many years. Fruit from this territory is now starting to move to the market and while most of the movement at this time is grapefruit, it will be a matter of only a few days before oranges will also start moving. We have had considerable trouble with scale insects this year as we have had for the past several years but it now appears that we have them under control better at this time than during the past few years. Our fertilizer program is getting under way and there will be no stinting of poundage in this territory during the fall season. Neither will there be any stinting as far as secondaries are concerned.

SOUTH FLORIDA & HIGHLANDS COUNTY

R. L. (Bob) Padgett

Highlands County has been suffering from the dry weather for a long time but at long last we are getting plenty of rain. These rains have been wonderful for the groves in this territory and they are now in better shape than they have been for a number of months. As stated in every report for the past few months we have a short crop of seedy grapefruit and the recent estimate confirms our opinion. We are glad to report that prices being offered by the on-the-tree buyers are very good for common grapefruit and over the whole season it is doubtful that the grower will lose a great deal as the sizes will be good and this will make for more boxes. Our fertilizer program is well under way and by the first of December will have been completed. We have a new canning plant that will be in operation here during the coming season, and from every indication they will do a very fine business.

ADVERTISEMENT—LYONS FERTILIZER COMPANY

The recent reports made that seedy kinds of grapefruit would be considerably less this season than last year brought a lot of fruit buyers out lookin' for common grapefruit, but when they got to lookin' around they found the situation like Old Mother Hubbard's cupboard, 'cause for the past several months on-the-tree buyers has been takin' all of this kind of fruit they could buy, or else the growers has decided to hold it 'till later in the season. Observers say that sizes will be large and that the quality of this grade of stuff will be excellent this season.

Fall fertilizin' is gettin' a good start and as in the past growers is usin' a complete fertilizer mixture that contains plenty of all the secondary plant foods so as to git the most good out of this application. Most everybody agrees that the fall application is the most important of all since it determines to a large extent the amount of bloom that'll be set next spring.

The 13th annual meetin' of the Citrus Growers Institute met at Camp McQuarrie in Lake county recently, with the Lake County Horticultural Society as hosts. A lot of interestin' and educational talks was made by leaders in the industry over the state. This gatherin' brings a lot of good fellowship among citrus folks and is a good thing for the industry. Bob Norris, Lake County agricultural agent has shore done a fine job for his work with the Institute.

Vegetable growers is gettin' under way in earnest, and the outlook is for a bumper crop this year, which will be good news to Florida growers and to the rest of the nation which knows that Florida vegetables gives 'em more vitamins than any other kind.

Have you heard about LITTLE TUFFY? If you haven't you ought to investigate it, for Little Tuffy is the finest small fertilizer spreader ever developed. It was built to help the small grove owner and fer spreadin' fertilizer and fertilizer materials on pasture land. It is the agitator type and will carry about 1500 pounds of fertilizer. The Lyons Fertilizer Company is distributors fer it. It'll pay you to investigate.

Uncle Bill

Citrus Research On The East Coast Of Florida

Continued from September Issue

About 6 or 7 years ago many growers still questioned the advantages of spray applications of zinc and manganese over soil applications, even on soils of high pH. More as a demonstration of the relative effectiveness of the two methods of application than as an experiment, Dr. A. F. Camp and Mr. W. W. Lawless laid out a series of plots in a bearing Valencia grove with a soil pH of about 7.5 on Merritt Island. Soil applications of sulfur and various combinations of sulfur, zinc sulfate, manganese sulfate, iron sulfate, and borax were given as well as a zinc, manganese spray to individual plots in triplicate annually for 4 years. All plots, including 4 controls, received the usual mixed fertilizers, an annual copper melanose spray, and periodic sulfur sprays and dusts for mite control. At the third harvest after treatment was started there was a marked difference between the zinc-manganese sprayed plots and all other plots with respect to tree condition and yield. All except the sprayed plots were decidedly zinc and manganese deficient. The average annual production per tree on the zinc-manganese sprayed plots for the last two years of the demonstration was 0.55 of a field box more than the next highest yielding treatment, 1.08 field boxes more than the controls, and 1.33 field boxes more than the average of all other treatments including controls. With the exception of the spray treatments, none of the treatments were consistent in performance rank for the two years. More complete data on these results have been published elsewhere (9) (10).

Some Miscellaneous Work:

A salt survey of the waters of the Davie canal system was made about a year ago. The salt content of both the North and the South New River Canals below the locks, as well as many of the laterals below the locks, were highly saline. In the 2 main canals adjacent to citrus groves salt contents of 5000 to 10,000 ppm were common. One sample taken about 1-4 mile from a young grove analyzed 25,000 ppm. Some of the laterals along-side groves tested 8000 to 9000 ppm. A few water and soil samples taken from borings in groves near canals showed there had been little salt intrusion or accumulation. Above the locks the canals were practically fresh, about 60 to 110 ppm. Little rainfall in the Davie-Okeechobee region for several months previous to the survey had resulted in decreased flushing with fresh water and a gradual encroachment of saline waters through tidal effects. Thus the salt content of these canals is probably not always in these magnitudes. However, the water is very likely frequently too salty below the locks for safe irrigation. With citrus 2000 ppm salt in irrigation water is considered dangerous. Shallow wells below the locks used for irrigation might salt-up under the recharge demands of heavy pumping. Although no salt damage was reported from that section on citrus it seems advisable tnat the growers be informed of the condition.

Within the past year some time has been devoted to exploring the possibilities of controlling noxious plants in groves and grove sources with, two 4-D sprays. A report on the progress made thus far with this will be given in another paper at this meeting (8).

In addition to these research projects, it should be mentioned that the Citrus Station cooperates, insofar as possible, with growers on the East Coast whenever they encounter some acute problem which cannot wait for routine research for a solution. In such cases the men from the Station whoare best fitted to serve usually try to visit the scene of the trouble and make recommendations or conduct whatever tests are necessary for a solution.

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CITRUS NURSERY INSPECTION IN FLORIDA

(Continued from page 3)

be found constituted a menace to the entire industry. Records were found, after months of hard work and at considerable expense, indicating that 3,131 shipments of nursery trees comprising a total of 358,512 trees had been shipped to 427 localities in 51 counties in Florida. Inspection of these trees disclosed the fact that citrus canker had beome established in 62 centers in the state. Fifty-six, or 90 per cent, of these centers were traceable to infected trees shipped from one nursery. Incidentally, there is no record of the spread of citrus canker from any nursery subsequent to the passage of the Plant Act and creation of the State Plant Board.

It can readily be seen, therefore, that one of the quickest ways to spread insects and diseases throughout the state is by means of pest-ridden nursery stock. The Board, in seeking some way to obtain complete records of all trees moved in the future from nurseries in the state, adopted a rule requiring all nurserymen to report to the Board's Nursery Inspector at Gainesville all nursery stock sold, together with the names and addresses of the people who bought the plants. Out-of-state nurserymen are required to furnish similar information. As a result, the Board's Nursery Inspector today can turn to his records and locate most of the trees sold from any one nursery in the state for many years past. This is in decided contrast with the situation in 1915, when it was most difficult to learn the destinations to which trees from canker-infested nurseries had been sent. Had such information been instantly available in 1915, citrus canker could have been eradicated at an earlier date and at less cost.

The Plant Board's Nursery Inspection Department consists of one Chief Inspector, with headquarters at Gainesville, and eight assistant inspectors. The state is divided into eight nursery inspection districts, with an inspector stationed at a central point in each one. These headquarters are at West Palm Beach, Miami, Winter Haven Arcadia, Eustis, Tampa, Gainesville and Orlando.

Last year these individuals inspected some 6,500 acres of citrus, 5537 acres of pecans, 227 acres of tung trees, and over 13,000 acres of ornamental plants. As the same climatic conditions that make Florida so attractive to mankind are also favorable for the development and spread of plant pests, it is necessary that our nurseries be inspected at frequent intervals in order to detect at the earliest possible moment the presence of any new pest, and to bring it under control, before it has an opportunity to become widely disseminated. Each nursery in Florida was inspected an average of 4.8 times last year. During the course of these inspections, 566 specimens of infested or infected plant material were collected and sent to the Board's Entomologist at Gainesville for identification. As the presence of some new pest, or the presence of the more common ones in unusual numbers, demands that the nursery be quarantined the determination of pests found is an important matter.

For this reason no quarantine is imposed until after the Nursery Inspector and the Entomologist have examined the specimens and reached the decision that quarantine action is desirable. The total number of nurseries quarantined in whole or

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CITRUS NURSERY INSPECTION . . . IN FLORIDA

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in part last year was 260. No new pests were found in any case. Quarantine action was taken on account of large numbers of common insects, and the quarantine remained in effect until after the nurseryman had applied control measures and the plants had been cleaned up.

Some people inquire why the Plant Board quarantines a nursery when common pests are found therein—pests that can be found almost anywhere in the state. The purchaser is entitled to receive a plant or tree that is free from plant pests. He should not be required to go to the trouble of spraying a new plant to remove insects or diseases that may seriously affect the vitality of the plant or even kill it.

While the Plant Board does not consider bulbs or ferns as being nursery stock, inspections are made of plantings of this nature in order that the owner may comply with the restrictions of out-of-state inspection departments and ship his material to destinations in those states. Last year inspections were made of some 200,000 amaryllis bulbs, 170,000 caladiums, 5,000 callas, 40,000,000 gladioli, 1,500,000 lilies, 77,000,000 narcissi. In addition some 15,000,000 vegetable plants were inspected and certified for shipment into other states.

Citrus, of course, is the big industry in Florida. Particular attention is paid to all citrus nurseries. We believe you will be interested in the amount of citrus nursery stock of all kinds moved from Florida nurseries to destinations in Florida during the past several years: In 1940-41, 764,249; 1941-42, 749,888; 1942-43, 728,622; 1943-44, 946,322; 1944-45, 857,037.

As previously stated, inspections of nursery stock, bulbs and vegetable plants must be made for nurserymen who desire to ship into other states and foreign countries. Last year the Plant Board's nursery inspection certificates, covering many nurseries in Florida, were sent to nursery inspectors in 46 states in the Union, and to three foreign countries. Before the war, there were a number of foreign countries into which Florida citrus trees were shipped. This movement fell off as a result of the war. It is expected, however, that shipments to foreign countries will increase greatly within the next year or two.

CLASSIFIED Advertisements

The rate for advertisements of this nature is only five cents per word for each insertion. You may count the number of words you have, multiply it by five, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

I CAN SELL YOUR CITRUS grove. I have buyers waiting. Send me a full description, location and price. Donald Ruff, Realtor, 3319 San Pedro, Tampa, Florida.

SUPERINTENDENT OF ESTATE wants position, Agricultural College, thorough Southern and Northern experience, able landscape architect and horticulturist. Game and forest management. Highly recommended. Box 279, care Citrus Industry.

CITRUS TREES—Best quality usual varities on sour orange or rough lemon stock. Robt. P. Thornton, c/o Clay Hill Nurseries Co., Box 2880, Tampa, Florida.

MANAGER OF GROVE and packing house. 20 years Florida experience. Please give details and salary in letter. Box 268, care Citrus Industry.

BIG CITRUS GROVE FOR SALE, heavy producer, several varieties oranges and grapefruit, well located near railroad siding, fertile soil, good frost protection. Reasonably priced. For sale by Charlton & Associates, Valuation Engineers and Realty Appraisers, Ft. Lauderdale, Fla.

WANTED: MARRIED COUPLE — Preferably with car. Live on grove—do general grove work. House with running water furnished—Electrically equipped. — Hull Fruit Co. West Palm Beach, Fla.

WANTED TO BUY — REAL ESTATE — My wife and I desire ten (10) acres or more citrus grove plus additional acreage and home or homesite. Immediate possession not required. Furnish full particulars. Cash or mortgage as you desire. N. W. Oppenheim 155 Humes Place, Memphis 11, Tenn.

POSITION WANTED BY MANAGER of agricultural corporation or company, administrator, capable of handling large staff. Excellent references. Box 27, care Citrus Industry.

FOR SALE BY RETIRING OWNER—20 Acre, 14 year old citrus grove of Valencia and Temple oranges and Marsh Seedless grapefruit. Located on paved road in the heart of the famous Indian River citrus section. Has excellent drainage and good artesian well. Average returns for past two years $9000.00. Purchase price $1500.00 per acre. For further particulars communicate with owner, Alfred Warren, Route 1, Box 212 Vero Beach, Florida. Phone 4662.